

# **Exhibit A**

**Gregory R. Ganger**  
 Dept. of ECE, CIC 2208  
 Carnegie Mellon University  
 Pittsburgh, PA 15213  
 Office Telephone: (412) 268-1297  
[ganger@ece.cmu.edu](mailto:ganger@ece.cmu.edu)  
<http://www.ece.cmu.edu/~ganger/>

## Research Interests

Design, implementation, and evaluation of computer systems, spanning the areas of operating systems, file and storage systems, security, networking, and distributed systems.

## Education

<u>Degree</u>	<u>Discipline</u>	<u>University</u>	<u>Date</u>
B.S.	Computer Science	University of Michigan	5/91
M.S.	Computer Science & Eng.	University of Michigan	5/93
Ph.D.	Computer Science & Eng.	University of Michigan	6/95

## Honors

ACM Distinguished Engineer (2007)  
 Best Paper Award, ACM Sigmetrics Conference (2007)  
 Best Paper Award, FAST: Conference on File and Storage Technologies (2005)  
 Best Paper Award, FAST: Conference on File and Storage Technologies (2005)  
 Best Student Paper Award, FAST: Conference on File and Storage Technologies (2004)  
 Best Student Paper Award, FAST: Conference on File and Storage Technologies (2002)  
 IBM Faculty Partnership Award (1999-2000, 2000-2001, 2001-2002)  
 Champions, Intramural 3-on-3 basketball, CMU (Spring 2001)  
 Best Paper Award, USENIX Technical Conference (1997)  
 Computer Measurement Group (CMG) Fellowship (1994-1995)  
 Best Paper Award, Honorable Mention, USENIX OSDI Symposium (1994)

## Current Position

December 1997 - Present

Professor, Department of Electrical and Computer Engineering and School of Computer Science  
 Director, Parallel Data Lab  
 Carnegie Mellon University, Pittsburgh, PA

## Previous Positions

August 1995 - November 1997

Postdoctoral Associate, M.I.T. Laboratory for Computer Science, Cambridge, MA  
 Summer 1994

Research Intern, Hewlett-Packard Laboratories, Palo Alto, CA

Winter/Spring 1994

Research Intern, Digital Equipment Corporation, Shrewsbury, MA  
 Summers 1991 and 1990

Research Intern, NCR Corporation, Columbia, SC

## Archival Papers

1. E. Thereska, G. Ganger. "IRONModel: Robust Performance Models in the Wild." *ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, Annapolis, MD, June 2008.
2. A. Phanishayee, E. Krevat, V. Vasudevan, D. Andersen, G. Ganger, G. Gibson, S. Seshan. "Measurement and Analysis of TCP Throughput Collapse in Cluster-based Storage Systems." *USENIX Conference on File and Storage Technologies (FAST)*, San Jose, CA, February 2008.
3. J. Strunk, E. Thereska, C. Faloutsos, G. Ganger. "Using Utility to Provision Storage Systems." *USENIX Conference on File and Storage Technologies (FAST)*, San Jose, CA, February 2008.
4. S. Shah, C. Soules, G. Ganger, B. Noble. "Using Provenance to Aid in Personal File Search." *USENIX Annual Technical Conference*, Santa Clara, CA, June 2007.
5. J. Hendricks, G. Ganger, M. Reiter. "Low-overhead Byzantine Fault-tolerant Storage." *ACM Symposium on Operating Systems Principles (SOSP)*, Stevenson, WA, October 2007.
6. J. Hendricks, G. Ganger, M. Reiter. "Verifying Distributed Erasure-coded Data." *ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC)*, Portland, OR, August 2007.
7. M. Mesnier, M. Wachs, R. Sambasivan, A. Zheng, G. Ganger. "Modeling the Relative Fitness of Storage." *ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, San Diego, CA, June 2007. (**Best Paper Award**)
8. M. Shao, S. Papadomanolakis, S. Schlosser, J. Schindler, A. Ailamaki, G. Ganger. "MultiMap: Preserving Disk Locality for Multidimensional Datasets." *International Conference of Data Engineering (ICDE)*, Istanbul, Turkey, April 2007.
9. M. Mesnier, M. Wachs, R. Sambasivan, J. Lopez, J. Hendricks, G. Ganger. "//TRACE: Parallel Trace Replay with Approximate Causal Events." *USENIX Conference on File and Storage Technologies (FAST)*, San Jose, CA, February 2007.
10. M. Wachs, M. Abd-El-Malek, E. Thereska, G. Ganger. "Argon: Performance Insulation for Shared Storage Servers." *USENIX Conference on File and Storage Technologies (FAST)*, San Jose, CA, February 2007.
11. M. Abd-El-Malek, W. Courtright, C. Cranor, G. Ganger, J. Hendricks, A. Klosterman, M. Mesnier, M. Prasad, B. Salmon, R. Sambasivan, S. Sinnamohideen, J. Strunk, E. Thereska, M. Wachs, J. J. Wylie. "Early Experiences on the Journey Towards Self-\* Storage." *Bulletin of the IEEE Computer Society Technical Committee on Data Engineering*, September 2006.
12. E. Hoke, J. Sun, J. Strunk, G. Ganger, C. Faloutsos. "InteMon: Continuous Mining of Sensor Data in Large-scale Self-\* Infrastructures." *ACM SIGOPS Operating Systems Review*, Vol 40, Issue 3, ACM Press, July 2006.
13. E. Thereska, B. Salmon, J. Strunk, M. Wachs, M. Abd-El-Malek, J. Lopez, G. R. Ganger. "Stardust: Tracking Activity in a Distributed Storage System." *ACM International Conference on Measurement and Modeling of Computer Systems, (SIGMETRICS)*, Saint-Malo, France, June 2006.
14. E. Thereska, M. Abd-El-Malek, J. J. Wylie, D. Narayanan, G. Ganger. "Informed Data Distribution Selection in a Self-predicting Storage System." *International Conference on Autonomic Computing (ICAC)*, Dublin, Ireland, June 2006.
15. M. Abd-El-Malek, W. Courtright, C. Cranor, G. Ganger, J. Hendricks, A. Klosterman, M. Mesnier, M. Prasad, B. Salmon, R. Sambasivan, S. Sinnamohideen, J. Strunk, E. Thereska, M. Wachs, J. J. Wylie. "Ursa Minor: Versatile Cluster-based Storage." *USENIX Conference on File and Storage Technology (FAST)*, San Francisco, CA, December 2005. (**Best Paper Award**)

16. S. Schlosser, J. Schindler, S. Papadomanolakis, M. Shao, A. Ailamaki, C. Faloutsos, G. Ganger. "On Multidimensional Data and Modern Disks." *USENIX Conference on File and Storage Technology (FAST)*, San Francisco, CA, December 2005. (**Best Paper Award**)
17. D. Petrou, G. Gibson, G. Ganger. "Scheduling Speculative Tasks in a Compute Farm." *ACM/IEEE Supercomputing 2005 Conference*, Seattle, WA, November 2005.
18. M. Abd-El-Malek, G. Ganger, G. Goodson, M. Reiter, J. J. Wylie. "Fault-Scalable Byzantine Fault-Tolerant Services." *ACM Symposium of Operating Systems Principles (SOSP)*, Brighton, United Kingdom, October 2005.
19. M. Abd-El-Malek, G. Ganger, G. Goodson, M. Reiter, J. J. Wylie. "Lazy Verification in Fault-Tolerant Distributed Storage Systems." *IEEE Symposium on Reliable Distributed Systems (SRDS)*, Orlando, FL, October 2005.
20. C. Soules, G. Ganger. "Connections: Using Context to Enhance File Search." *ACM Symposium of Operating Systems Principles (SOSP)*, Brighton, United Kingdom, October 2005.
21. R. Sambasivan, A. Klosterman, G. Ganger. "Replication Policies for Layered Clustering of NFS Servers." *IEEE International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS)*, Atlanta, GA, September 2005.
22. Y.-L. Tan, T. Wong, J. Strunk, G. Ganger. "Comparison-based File Server Verification." *USENIX Annual Technical Conference*, Anaheim, CA, April 2005.
23. C. Lumb, G. Ganger, R. Golding, "D-SPTF: Decentralized Request Distribution in Brick-based Storage Systems." *International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, October 2004.
24. M. Wang, K. Au, A. Ailamaki, A. Brockwell, C. Faloutsos, and G. Ganger. "Storage Device Performance Prediction with CART Models." *IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS)*, Volendam, The Netherlands, October 2004.
25. M. Shao, J. Schindler, S. Schlosser, A. Ailamaki, G. Ganger. "Clotho: Decoupling Page Layout from Storage Organization." *Very Large Data Bases (VLDB) Conference*, Toronto, Canada, August-September 2004.
26. D. Petrou, G. Ganger, G. Gibson. "Cluster Scheduling for Explicitly Speculative Tasks." *ACM International Conference on Supercomputing (ICS)*, Saint-Malo, France, June-July 2004.
27. G. Goodson, J. J. Wylie, G. Ganger, M. Reiter. "Efficient Byzantine-tolerant Erasure-coded Storage." *International Conference on Dependable Systems and Networks (DSN)*, Palazzo dei Congressi, Florence, Italy, June-July 2004.
28. C. Wong, C. Wang, D. Song, S. Bielski, G. Ganger. "Dynamic Quarantine of Internet Worms." *International Conference on Dependable Systems and Networks (DSN)*, Palazzo dei Congressi, Florence, Italy, June-July 2004.
29. J. J. Wylie, G. Goodson, G. Ganger, M. Reiter. "Byzantine-Tolerant Erasure-Coded Storage." *International Conference on Dependable Systems and Networks (DSN)*, July 2004.
30. M. Wang, K. Au, A. Ailamaki, A. Brockwell, C. Faloutsos, G. Ganger. "Storage Device Performance Prediction with CART Models." *ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, June 2004.
31. M. Mesnier, E. Thereska, D. Ellard, G. Ganger, M. Seltzer. "File Classification in Self-\* Storage Systems." *International Conference on Autonomic Computing (ICAC)*, New York, NY, May 2004.
32. S. Schlosser, G. Ganger. "MEMS-based Storage Devices and Standard Disk Interfaces: A Square Peg in a Round Hole?" *USENIX Conference on File and Storage Technologies (FAST)*, March-April 2004.

33. J. Schindler, S. Schlosser, M. Shao, A. Ailamaki, G. Ganger. "Atropos: A Disk Array Volume Manager for Orchestrated Use of Disks." *USENIX Conference on File and Storage Technologies (FAST)*, San Francisco, CA, March 2004.
34. E. Thereska, J. Schindler, J. Bucy, B. Salmon, C. Lumb, G. Ganger. "A Framework for Building Unobtrusive Disk Maintenance Applications." *USENIX Conference on File and Storage Technologies (FAST)*, San Francisco, CA, March 2004.
35. L. Huston, R. Sukthankar, R. Wickremesinghe, M. Satyanarayanan, G. Ganger, E. Riedel, A. Ailamaki. "Diamond: A Storage Architecture for Early Discard in Interactive Search." *USENIX Conference on File and Storage Technologies (FAST)*, San Francisco, CA, March 2004.
36. M. Mesnier, G. Ganger, E. Riedel. "Object-Based Storage", *IEEE Communications*, Vol. 41, No. 8, August 2003.
37. J. Schindler, A. Ailamaki, G. Ganger. "Lachesis: Robust Database Storage Management Based on Device-specific Performance Characteristics." *Very Large Data Bases (VLDB) Conference*, August 2003.
38. A. Pennington, J. Strunk, J. Griffin, C. Soules, G. Goodson, G. Ganger. "Storage-Based Intrusion Detection: Watching Storage Activity for Suspicious Activity." *USENIX Security Symposium*, August 2003.
39. C. Soules, J. Appavoo, K. Hui, R. Wisniewski, D. Da Silva, G. Ganger, O. Krieger, M. Stumm, M. Auslander, M. Ostrowski, B. Rosenburg, K. Xenidis. "System Support for Online Reconfiguration." *USENIX Annual Technical Conference*, June 2003.
40. C. Soules, G. Goodson, J. Strunk, G. Ganger. "Metadata Efficiency in Versioning File Systems." *USENIX Conference on File and Storage Technologies (FAST)*, March 2003.
41. J. Appavoo, K. Hui, C. Soules, R. Wisniewski, D. Da Dilva, O. Krieger, M. Auslander, D. Edelsohn, B. Gamsa, G. Ganger, P. McKenney, M. Ostrowski, B. Rosenburg, M. Stumm, J. Xenidis. "Enabling Autonomic Behavior in Systems Software with Hot Swapping." *IBM Systems Journal*, Vol. 43, No. 1, pp. 60-76, 2003.
42. G. Ganger, D. Engler, M. F. Kaashoek, H. Briceno, R. Hunt, T. Pinckney. "Fast and Flexible Application-Level Networking on Exokernel Systems." *ACM Transactions on Computer Systems*, Vol. 20, No. 1, pp. 49-83, February 2002.
43. J. Griffin, S. Schlosser, J. Schindler, G. Ganger. "Timing-Accurate Storage Emulation." *USENIX Conference on File and Storage Technologies (FAST)*, January 2002.
44. C. Lumb, J. Schindler, G. Ganger. "Freeblock Scheduling Outside of Disk Firmware." *USENIX Conference on File and Storage Technologies (FAST)*, January 2002.
45. J. Schindler, J. Griffin, C. Lumb, G. Ganger. "Track-Aligned Extents: Matching Access Patterns to Disk Drive Characteristics." *USENIX Conference on File and Storage Technologies (FAST)*, January 2002. (**Best Student Paper Award**)
46. L. R. Carley, G. Ganger, D. Guillou, D. Nagle. "System Design Considerations for MEMS-Actuated Magnetic Probe Based Mass Storage." *IEEE Transactions on Magnetics*, Vol. 37, No. 2, pp. 61-68, March 2001.
47. L. R. Carley, G. Ganger, D. Nagle. "MEMS-Based Integrated Circuit Mass Storage Systems." *Communications of the ACM*, Vol. 43, No. 11, pp 72-80, November 2000.
48. S. Schlosser, J. Griffin, D. Nagle, G. Ganger. "Designing Computer Systems with MEMS-Based Storage." *International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, November 2000.
49. J. Strunk, G. Goodson, M. Scheinholtz, C. Soules, G. Ganger. "Self-Securing Storage: Protecting Data in Compromised Systems." *USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, October 2000.
50. J. Griffin, S. W. Schlosser, G. R. Ganger, D. Nagle. "Operating Systems Management of MEMS-Based Storage Devices." *USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, October 2000.

51. C. Lumb, J. Schindler, G. Ganger, D. Nagle, E. Riedel. "Towards Higher Disk Head Utilization: Extracting Free Bandwidth From Busy Disk Drives." *USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, October 2000.
52. J. J. Wylie, M. Bigrigg, J. Strunk, G. Ganger, H. Kiliccote, P. Khosla. "Survivable Information Storage Systems." *IEEE Computer*, Vol. 33, No. 8, August 2000, pp. 61-68.
53. L. R. Carley, G. Ganger, D. Guillou, D. Nagle. "System Design Considerations for MEMS-Actuated Magnetic Probe Based Mass Storage." *Digests of The Magnetic Recording Conference (TMRC)*, Santa Clara, CA, August 2000, pp. B6.1-6.
54. J. Griffin, S. Schlosser, G. Ganger, D. Nagle. "Modeling and Performance of MEMS-Based Storage Devices." *ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, June 2000.
55. J. Schindler, G. Ganger. "Automated Disk Drive Characterization." *ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, June 2000.
56. K. Amiri, D. Petrou, G. Ganger, G. Gibson. "Dynamic Function Placement for Data-intensive Cluster Computing." *USENIX Annual Technical Conference*, June 2000.
57. M. Seltzer, G. Ganger, M. K. McKusick, K. Smith, C. Soules, C. Stein. "Journaling Versus Soft Updates: Asynchronous Meta-data Protection in File Systems." *USENIX Annual Technical Conference*, June 2000.
58. G. Ganger, M. K. McKusick, C. Soules, Y. Patt. "Soft Updates: A Solution to the Metadata Update Problem in File Systems." *ACM Transactions on Computer Systems*, Vol. 18, No. 2, May 2000.
59. E. Riedel, C. Faloutsos, G. Ganger, D. Nagle. "Data Mining on an OLTP System (Nearly) for Free." *ACM SIGMOD Conference on Data Management (SIGMOD)*, May 2000.
60. G. Ganger, Y. Patt. "Using System-Level Models to Evaluate I/O Subsystems Designs." *IEEE Transactions on Computers*, Vol. 47, No. 6, pp. 667-678, June 1998.
61. M. F. Kaashoek, D. Engler, G. Ganger, H. Briceno, R. Hunt, D. Mazieres, T. Pinckney, R. Grimm, J. Jannotti, K. MacKenzie. "Application Performance and Flexibility on Exokernel Systems." *ACM Symposium on Operating Systems Principles (SOSP)*, October 1997.
62. G. Ganger, M. F. Kaashoek. "Embedded Inodes and Explicit Grouping: Exploiting Disk Bandwidth for Small Files." *USENIX Annual Technical Conference*, January 1997. (**Best Paper Award**).
63. M. F. Kaashoek, D. Engler, G. Ganger, D. Wallach. "Server Operating Systems." *ACM SIGOPS European Workshop*, September 1996.
64. B. Worthington, G. Ganger, Y. Patt, J. Wilkes. "On-Line Extraction of SCSI Disk Drive Parameters." *ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, May 1995.
65. G. Ganger, B. Worthington, R. Hou, Y. Patt. "Disk Arrays: High-Performance, High-Reliability Storage Subsystems." *IEEE Computer*, Vol. 27, No. 3, March 1994, pp. 30-36.
66. G. Ganger, Y. Patt. "Metadata Update Performance in File Systems." *USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, November 1994. (**Best Paper Award**, Honorable Mention)
67. B. Worthington, G. Ganger, Y. Patt. "Scheduling Algorithms for Modern Disk Drives." *ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, May 1994.
68. G. Ganger, Y. Patt. "The Process-Flow Model: Examining I/O Performance from the System's Point of View." *ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, May 1993.

## Invited Papers (with Talks)

1. L. R. Carley, R. El-Sayed, D. Guillou, F. Alfaro, G. Fedder, S. Schlosser, D. Nagle, G. Ganger, J. Bain. "MEMS Memory Elements." *NonVolatile Memory Technology Symposium (NVMTS)*, November 2001.
2. D. Nagle, G. Ganger, J. Butler, G. Goodson, C. Sabol. "Network Support for Network- attached Storage." *Hot Interconnects*, August 1999.
3. G. Ganger, M. F. Kaashoek, D. Nagle. "Building Low-Cost Servers with Commodity PC Systems." *Workshop on PC-based System Performance and Analysis*, October 1998.
4. G. Ganger. "Generating Representative Synthetic Workloads: An Unsolved Problem." *Annual Computer Measurement Group Conference (CMG)*, December 1995.

## Other Conference and Workshop Papers

1. E. Krevat, V. Vasudevan, A. Phanishayee, D. Andersen, G. Ganger, G. Gibson, S. Seshan. "On Application-level Approaches to Avoiding TCP Throughput Collapse in Cluster-based Storage Systems." *International Petascale Data Storage Workshop (PDSW)*, Reno, NV, November 2007.
2. R. Sambasivan, A. Zheng, E. Thereska, G. Ganger. "Categorizing and Differencing System Behaviours." *Workshop on Hot Topics in Autonomic Computing*, Jacksonville, FL, June 2007.
3. E. Thereska, D. Narayanan, A. Ailamaki, G. Ganger. "Observer: Keeping System Models from Becoming Obsolete." *Workshop on Hot Topics in Autonomic Computing*, Jacksonville, FL, June 15, 2007.
4. E. Thereska, D. Narayanan, G. Ganger. "Towards Self-predicting Systems: What If You Could Ask "What-if"?" *International Workshop on Self-adaptive and Autonomic Computing Systems*, Copenhagen, Denmark, August 2005.
5. M. Wang, K. Au, A. Ailamaki, A. Brockwell, C. Faloutsos, and G. Ganger. "Storage Device Performance Prediction with CART Models [Extended Abstract]." *Proceedings: Poster Session. Joint International Conference on Measurement and Modeling of Computer Systems, ACM SIGMETRICS/Performance*, Columbia University, NY, June 2004.
6. J. J. Wylie, G. Goodson, G. Ganger, M. Reiter. "A Protocol Family Approach to Survivable Storage Infrastructures." *Workshop on Future of Distributed Computing (FuDiCo-II: Survivability Obstacles and Solutions)*, June 2004.
7. J. Schindler, A. Ailamaki, G. Ganger. "Lachesis: Robust Database Storage Management Based on Device-specific Performance Characteristics." *2<sup>nd</sup> Hellenic Data Management Symposium (HDMS)*, September 2003.
8. J. Strunk, G. Ganger. "A Human Organization Analogy for Self-\* Systems." *Workshop on Algorithms and Architectures for Self-Managing Systems*, June 2003.
9. B. Salmon, E. Thereska, C. Soules, G. Ganger. "A Two-Tiered Software Architecture for Automated Tuning of Disk Layouts." *Workshop on Algorithms and Architectures for Self-Managing Systems*, June 2003.
10. C. Soules, G. Ganger. "Why Can't I Find My Files? New Methods for Automating Attribute Assignment." *Workshop on Hot Topics In Operating Systems*, May 2003.
11. G. Ganger, D. Nagle. "Better Security via Smarter Devices." *Workshop on Hot Topics In Operating Systems*, May 2001.
12. G. Ganger. "Authentication Confidences." *Workshop on Hot Topics In Operating Systems*, May 2001.
13. G. Ganger, P. Khosla, M. Bakkaloglu, M. Bigrigg, G. Goodson, S. Oguz, J. Ordia, V. Pandurangan, C. Soules, J. Strunk, J. J. Wylie. "Survivable Storage Systems." *2<sup>nd</sup> DARPA Information Survivability Conference and Exposition*, June 2001.

14. M. K. McKusick, G. Ganger. "Soft Updates: A Technique for Eliminating Most Synchronous Writes in the Fast Filesystem." *USENIX Annual Technical Conference, FREENIX track*, June 1999.
15. G. Ganger, B. Worthington, R. Hou, Y. Patt. "Disk Subsystem Load Balancing: Disk Striping vs. Conventional Data Placement." *Hawaii International Conference on System Sciences*, January 1993.
16. R. Hou, G. Ganger, Y. Patt, C. Gimarc. "Issues and Problems in the I/O Subsystem, Part I - The Magnetic Disk." *Hawaii International Conference on System Sciences*, 1992.

## Technical Reports

1. J. Bucy, J. Schindler, S. W. Schlosser, G. Ganger. "The DiskSim Simulation Environment Version 4.0 Reference Manual." Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-08-101, May 2008.
2. B. Salmon, S. Schlosser, L. Mummert, G. Ganger. "Putting Home Storage Management into Perspective." Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-06-110, September 2006.
3. J. Hendricks, S. Sinnamohideen, R. Sambasivan, G. Ganger. "Eliminating Cross-server Operations in Scalable File Systems." Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-06-105, May 2006.
4. J. Hendricks, R. Sambasivan, S. Sinnamohideen, G. Ganger. "Improving Small File Performance in Object-based Storage." Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-06-104, May 2006.
5. B. Salmon, S. Schlosser, G. Ganger. "Towards Efficient Semantic Object Storage for the Home." Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-06-103, May 2006.
6. M. Abd-El-Malek, G. Ganger, G. Goodson, M. Reiter, J. J. Wylie. "Correctness of the Read/Conditional-Write and Query/Update Protocols." Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-05-107, September 2005.
7. M. Mesnier, M. Wachs, G. Ganger. "Modeling the Relative Fitness of Storage Devices." Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-05-106, August 2005.
8. M. Shao, S. Schlosser, S. Papadomanolakis, J. Schindler, A. Ailamaki, C. Faloutsos, and G. Ganger. "MultiMap: Preserving Disk Locality for Multidimensional Datasets." Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-05-102, March 2005.
9. B. Salmon, E. Thereska, C. Soules, J. Strunk, G. Ganger. "Challenges in Building a Two-Tiered Learning Architecture for Disk Layout." Carnegie Mellon University Parallel Data Laboratory Technical Report CMU-PDL-04-109, August 2004.
10. C. Soules, G. Ganger. "Toward Automatic Context-based Attribute Assignment for Semantic File Systems." Carnegie Mellon University Parallel Data Laboratory Technical Report CMU-PDL-04-105, June 2004.
11. G. Goodson, J. J. Wylie, G. Ganger, M. Reiter. "The Safety and Liveness Properties of a Protocol Family for Versatile Survivable Storage Infrastructures." Carnegie Mellon University Parallel Data Laboratory Technical Report CMU-PDL-03-105, March 2004.
12. S. Schlosser, G. Ganger. "MEMS-based Storage Devices and Standard Disk Interfaces: A Square Peg in a Round Hole?" Carnegie Mellon University Parallel Data Lab Technical Report CMU-PDL-03-102, December 2003.
13. G. Ganger, J. Strunk, A. Klosterman. "Self-\* Storage: Brick-based Storage with Automated Administration." Carnegie Mellon University SCS Technical Report CMU-CS-03-178, August 2003.

14. G. Ganger, G. Goodson, J. J. Wylie, M. Reiter. "Efficient Consistency for Erasure-coded Data via Versioning Servers." Carnegie Mellon University SCS Technical Report CMU-CS-03-127, March 2003.
15. G. Ganger, A. Ailamaki, S. Schlosser, J. Schindler. "Exposing and Exploiting Internal Parallelism in MEMS-based Storage." Carnegie Mellon University SCS Technical Report CMU-CS-03-125, March 2003.
16. G. Ganger, G. Economou, S. Bielski. "Finding and Containing Enemies Within the Walls with Self-Securing Network Interfaces." Carnegie Mellon University SCS Technical Report CMU-CS-03-109, January 2003.
17. G. Goodson, J. J. Wylie, G. Ganger, M. Reiter. "Decentralized Storage Consistency via Versioning Servers." Carnegie Mellon University SCS Technical Report CMU-CS-02-180, September 2002.
18. A. Pennington, J. Strunk, J. Griffin, C. Soules, G. Goodson, G. Ganger. "Storage-Based Intrusion Detection: Watching Storage Activity for Suspicious Behavior." Carnegie Mellon University SCS Technical Report CMU-CS-02-179, September 2002.
19. J. Strunk, G. Goodson, A. Pennington, C. Soules, G. Ganger. "Intrusion Detection, Diagnosis, and Recovery with Self-Securing Storage." Carnegie Mellon University SCS Technical Report CMU-CS-02-140, May 2002.
20. G. Ganger, G. Economou, S. Bielski. "Self-Securing Network Interfaces: What, Why and How." Carnegie Mellon University SCS Technical Report CMU-CS-02-144, May 2002.
21. M. Bakkaloglu, J. J. Wylie, C. Wang, G. Ganger. "On Correlated Failures in Survivable Storage Systems." Carnegie Mellon University SCS Technical Report CMU-CS-02-129, May 2002.
22. E. Hogan, G. Gibson, G. Ganger. "Examining Semantics in Multi-Protocol Network File Systems." Carnegie Mellon University SCS Technical Report CMU-CS-02-103, January 2002.
23. G. Ganger. "Blurring the Line Between OSes and Storage Devices." Carnegie Mellon University SCS Technical Report CMU-CS-01-166, December 2001.
24. J. Schindler, J. Griffin, C. Lumb, G. Ganger. "Track-Aligned Extents: Matching Access Patterns to Disk Drive Characteristics." Carnegie Mellon University SCS Technical Report CMU-CS-01-119, April 2001.
25. J. J. Wylie, M. Bakkaloglu, V. Pandurangan, M. Bigrigg, S. Oguz, K. Tew, C. Williams, G. Ganger, P. Khosla. "Selecting the Right Data Distribution Scheme for a Survivable Storage Systems." Carnegie Mellon University SCS Technical Report CMU-CS-00-120, May 2001.
26. G. Ganger and D. Nagle. "Enabling Dynamic Security Management of Networked Systems via Device-Embedded Security." Carnegie Mellon University SCS Technical Report CMU-CS-00-174, December 2000.
27. T. Wong, G. Ganger, J. Wilkes. "My Cache or Yours? Making Storage More Exclusive." Carnegie Mellon University SCS Technical Report CMU-CS-00-157, November 2000.
28. A. Klosterman, G. Ganger. "Secure Continuous Biometric-Enhanced Authentication." Carnegie Mellon University SCS Technical Report CMU-CS-00-134, April 2000.
29. G. Ganger, D. Engler, M. F. Kaashoek, et al. "Fast and Flexible Application-level Networking on Exokernel Systems." Carnegie Mellon University SCS Technical Report CMU-CS-00-117, March 2000.
30. J. Schindler, G. Ganger. "Automated Disk Drive Characterization." Carnegie Mellon University SCS Technical Report CMU-CS-00-100, December 1999.
31. S. Schlosser, J. Griffin, D. Nagle, G. Ganger. "Filling the Memory Access Gap: A Case for On-Chip Magnetic Storage." Carnegie Mellon University SCS Technical Report CMU-CS-99-174, December 1999.
32. G. Ganger. "System-Oriented Evaluation of I/O Subsystem Performance." Ph.D. Dissertation, published as CSE-TR-243-95, University of Michigan, Ann Arbor, June 1995.

33. B. Worthington, G. Ganger, Y. Patt, J. Wilkes. "On-Line Extraction of SCSI Disk Drive Parameters." CSE-TR-323-96, University of Michigan, Ann Arbor, 1996.
34. G. Ganger, Y. Patt. "Soft Updates: A Solution to the Metadata Update Problem in File Systems." CSE-TR-254-95, University of Michigan, Ann Arbor, August 1995.
35. B. Worthington, G. Ganger, Y. Patt. "Scheduling for Modern Disk Drives and Non-Random Workloads." CSE-TR-194-94, University of Michigan, Ann Arbor, March 1994.

### **Ph.D.s Advised**

Dr. Garth Goodson  
 Dr. John Linwood Griffin  
 Dr. Chris Lumb  
 Dr. Mike Mesnier  
 Dr. David Petrou  
 Dr. Jiri Schindler  
 Dr. Steve Schlosser  
 Dr. Craig Soules  
 Dr. John Strunk  
 Dr. Eno Thereska  
 Dr. Jay Wylie  
 Dr. Shuheng Zhou

### **Program Committee Member**

- 2009 Conference on File and Storage Technologies (FAST)
- 2008 Symposium on Operating System Design and Implementation (OSDI)
- 2006 First Workshop on Tackling Computer Systems Problems with Machine Learning Techniques (SysML)
- 2004 Symposium on Operating System Design and Implementation (OSDI)
- 2004 Architectural Support for Prog. Languages and Operating Systems (ASPLOS)
- 2004 Conference on File and Storage Technologies (FAST)
- 2003 ACM Workshop on Survivability and Self-Regenerative Systems
- 2003 Conference on File and Storage Technologies (FAST)
- 2002 Symposium on Operating System Design and Implementation (OSDI)
- 2002 USENIX Technical Conference
- 2001 USENIX Technical Conference
- 2001 International Symposium on High-Performance Computer Architecture
- 1999 Workshop on Internet Service Performance
- 1998 International Conference on Measurement and Modeling of Computer Systems

### **Other Conference and Service Roles**

Steering Committee, Conference on File and Storage Technologies (FAST), 2001-present  
 Session Chair, Conference on File and Storage Technologies (FAST), 2003  
 Session Chair, Symposium on Operating Systems Design and Implementation (OSDI), 2002  
 Session Chair, USENIX Technical Conference, 2001  
 Editorial Board, Computer Architecture Letters, November 2001- December 2005  
 Work In Progress organizer, USENIX Technical Conference, 2001  
 Session Chair, USENIX Technical Conference, 2001  
 Founding Organizing Committee, Conference on File and Storage Technologies, 2000

Publications Chair, Symposium on Operating Systems Principles, 2001  
Session Chair, Int'l Conf. on Measurement and Modeling of Computer Systems, 1998

### **Professional Societies**

American Society for Engineering Education (ASEE)  
Institute of Electrical and Electronics Engineers (IEEE) and IEEE Computer Society  
Association for Computing Machinery (ACM)  
USENIX Association  
Computer Measurement Group  
Phi Beta Kappa